DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Housing—Federal Housing Commissioner	**STRUCTURAL ENGINEERING BULLETIN NO.** 1090 Rev. 2 (Supersedes issue dated January 10, 1994)
TO: DIRECTOR, HOUSING DIVISION DIRECTOR, MULTIFAMILY DIVISION DIRECTOR, SINGLE FAMILY DIVISION	**ISSUE DATE:** January 28, 1998
	REVIEW DATE: January 28, 2001

SUBJECT:	**1. Item Description**	Field Constructed Shop Milled Log Housing System
	2. Name and address of Manufacturer	Appalachian Log Structures, Inc. P.O. Box 614 Route 21, South Ripley, WV 25271

This Structural Engineering Bulletin (SEB) should be filed with other SEBs and related Bulletins on materials or products as required by prescribed procedures.

1. General:

This Bulletin sets forth specific requirements under the Technical Suitability of Products Program for determining the eligibility of housing to be constructed under HUD mortgage insurance, or other HUD housing programs.

2. Scope:

This Bulletin applies only to the structural features of this method of construction. Final determination of eligibility is made by the appropriate HUD Field Office. Other factors considered by the Field Office will be valuation, location, architectural planning and appeal, mechanical equipment, thermal characteristics, and market acceptance. Consideration is also necessary to determine whether a specific property will qualify under the specific HUD program, when constructed according to the method outlined in this Bulletin, and where the structure is to be located.

In geographical areas subject to hurricanes, earthquakes, or other severe conditions affecting dwelling structures, the HUD Field Office shall require additional safeguards in proposed design, when necessary.

3. Minimum Property Standards (MPS):

Compliance with HUD MPS will be determined by the HUD Field Office on the same basis as submissions involving conventional construction, except for the special features described in this Bulletin.

4. Inspection:

Field compliance inspections covering conventional items of construction, and any special features covered in this Bulletin shall be made in accordance with prescribed procedures.

The appropriate HUD Field Office shall furnish a copy of a HUD field inspection report to Headquarters, Manufactured Housing and Standards Division, Office of Consumer and Regulatory Affairs, when there is:

a. Evidence of noncompliance with any portion of the system of construction described in this Bulletin.

b. Faulty shop fabrication, including significant surface defects.

c. Damage to shop fabricated items or materials due to improper transportation, storage, handling, or assembly.

d. Unsatisfactory field workmanship or performance of the product or system.

e. Any significant degradation or deterioration of the product or evidence of lack of durability or performance.

Periodic plant inspections will be made by HUD Field Office personnel in accordance with prescribed procedures. Factory inspection reports shall be submitted to HUD Headquarters, upon request.

5. Certification:

The manufacturer named in this Bulletin shall furnish the builder with written certification stating that the product has been manufactured in compliance with the HUD Minimum Property Standards (MPS), except as modified by this Bulletin. The builder shall endorse the certification with a statement that the product has been erected in compliance with HUD MPS except as modified by this Bulletin, and that the manufacturer's certification does not relieve the builder, in any way, of responsibility under the terms of the Builder's Warranty required by the National Housing Act, or under any provisions applicable to any other housing program. This certification shall be furnished to the HUD Field Office, upon completion of the property.

OUTLINE DESCRIPTION, CATEGORY II CONSTRUCTION

GENERAL:

Field constructed dwellings using shop-milled interlocking log wall building system and conventional construction features are furnished in this method of construction. Log walls may be used as interior or exterior loadbearing or non-loadbearing walls. Floor and roof framing members may be log floor joists and girders, log roof rafters or conventional wood construction.

This Bulletin is based on a structural review of the Wilmington and Allegheny models and log building system of Appalachian Log Structures, Inc., including the shop fabricated components and installation requirements of this company. This bulletin may be considered applicable to all structurally similar units of this company. Foundation design and nonstructural items (such as architectural, plumbing, heating and electrical features) are not covered by this Bulletin.

All materials and methods of installation shall be in accordance with HUD Minimum Property Standards, Use of Materials Bulletins (UM), and Materials Releases (MR), except as may be specifically noted herein.

SPECIFICATIONS:

Form HUD-92005, "Description of Materials" specifying only the structurally related items (Nos. 1 to 12, 14, 26 and 27), as submitted for review for determination of technical suitability, describes the materials that shall be used in construction of housing units under this system of construction. Form HUD-92005, furnished with each application for use under HUD housing programs, shall include as a minimum the same structural materials.

LOG GRADING AND GRADING RULES:

Logs used as wall elements, truss elements, and beams are graded as "Wall-Logs" or "Sawn Round Timber Beams", in accordance with ASTM D 3957-90, "Standard Methods for Establishing Stress Grades for Structural Members Used in Log Buildings." Certification that logs are graded in accordance with ASTM Specification D 3957-90 must be provided. Grading rules defining wall-log profile, limiting characteristics and allowable stresses are required, with data justifying those stresses.

All logs shall be identified by the grademark and/or Certificate of Inspection of a recognized grading association or of an independent lumber-grading inspection agency authorized to grade the species. Dimension lumber is graded and marked in accordance with PS 20-94 American Softwood Lumber Standard.

LOG GRADES:

Headers and openings (open span logs) -- Header (No. 1) Grade
Loadbearing and exterior wall logs ----- Wall (No. 2) Grade
Non-loadbearing interior wall logs ----- Utility (No. 3) Grade

SPECIAL CONSTRUCTION FEATURES:

General:

Southern yellow pine, eastern white pine, western red cedar and oak logs are shop-milled to 6" or 8" thickness available to eight (8) different log profiles with tongue and groove on top and bottom. Logs are pre-cut and coded to indicate specific length and location. Air drying and pressure chemical preservation treatment is accomplished at the plant prior to shipping. Set in horizontal courses, the wall-logs use a mortise and tenon, 1/2 DT notch or interlock corner system and are fastened to the preceding courses with 3/8" diameter, 12" long smooth shank steel spikes, 48" o.c. maximum, pre-drilled and countersunk to provide 5" penetration. One-half inch diameter through bolts are located on each side of wall corners and window and door openings. Openings are located and formed by wall-log placement as indicated by the log erection diagram, with header courses to extend continuously across the opening.

A nominal 4" thick timber used as a jamb, has a 2" x 3" lineal dap which fits into the log ends, providing a ship lapped slip joint. A 2" space exists over the header board for allowance of shrinkage. The pre-assembled door or window units are fastened in place following instructions provided with each units, with trim attached to the jambs.

Bearing beams and heavy timber upper floor joists (4" x 7 1/4" beams, 32" o.c.) are typically set into prefabricated steel joist hangers at both ends and lag bolted in the log wall girder beam. Rafters, 4" x 7 1/4", 4' o.c. with collar ties, span from a ridgebeam to the top log course of the sidewall. Air infiltration and moisture intrusion is restricted by the use of gasketing located on the tongue of wall-logs and caulking which provides butt and mortise joint sealant. A combination of caulk and gasketing provides door and window jamb sealant at log wall openings. Settlement voids are flashed and insulated with batt insulation.

SHRINKAGE ALLOWANCE:

Design shall account for total shrinkage and differential shrinkage of log walls. The amount and nature of shrinkage varies depending on log profile, species, moisture content and other factors. Shrinkage allowance is to be provided at windows, doors, interior walls and other areas that may be adversely affected. Submittals for a specific project shall include proper shrinkage allowance details.

PRESERVATION:

Exterior wall logs shall be pressure treated using chromated copper arsenate (CCA), sodium borate or any other method using approved preservative to resist insects and decay. Exterior wall logs shall be protected against moisture using an approved water-repellent preservative. All joints, saw cuts, deep checks and major surface cracks shall be sealed with caulk or other material against moisture intrusion. Areas which can collect moisture, such as lapped corners, shall be caulked against moisture intrusion or have adequate ventilation to remove any trapped moisture. The method of treatment shall be submitted to the local HUD Field Office for review and acceptance.

THERMAL PERFORMANCE:

Heating systems, insulation and heat loss calculations are subject to review by the local HUD Field Office. The complete documentation package submitted to the HUD Field Office with each application shall include an appropriate heating system with insulation provided to satisfy the requirements of the Minimum Property Standards.

DESIGN AND CONSTRUCTION REQUIREMENTS:

Design Basis: Design of the log housing system is based on an engineering report by Robert H. Fredericks, PhD., PE, Building Consultant, 1559 Connell Road, Charleston, WV 25314, (304) 346-6743. A copy of the report shall be furnished by the manufacturer to the HUD Field Office upon request.

Design Loads: The method described in this Bulletin is based on maximum design loads of 37 psf for snow, Seismic Zone 2, and Basic Wind Speed of 90 mph and Exposure C (ASCE 7-88). Structural calculations shall be submitted to the local HUD Office if housing units are to be located in geographical areas where these conditions are exceeded.

Framing of Walls: Adjustable Jacks shall be provided between non-log (conventionally framed) walls and roof/ceiling or floor construction. Floor covering, including carpeting and vinyl tile, shall not be continued under loadbearing walls.

Roof Construction: Trussed rafters shall be designed and constructed in accordance with ANSI/TPI 1-1995 Standard (American National Standards Institute and Truss Plate Institute), "National Design Standard for Metal Plate Connected Wood Truss Construction."

DRAWINGS:

The following drawings by Appalachian Log Structures shall be considered an integral part of this Bulletin:

Drawing No.	Date	Description
WILMINGTON		
1 of 9	11/19/90 Rev.	Elevations
2 of 9	11/19/90 Rev.	First Floor Plan
3 of 9	11/19/90 Rev.	Second Floor Plan
4 of 9	11/19/90 Rev.	Foundation Plan
5 of 9	11/19/90 Rev.	First Floor Framing Plan
6 of 9	11/19/90 Rev.	Wall Anchor Locations
7 of 9	11/19/90 Rev.	Second Floor Framing Plan
8 of 9	11/19/90 Rev.	Roof Framing Plan
9 of 9	11/19/90 Rev.	Building Section
ALLEGHENY		
1 of 9	12/9/87 Rev.	Elevations
2 of 9	12/2/87 Rev.	First Floor Plan
3 of 9	12/3/87 Rev.	Second Floor Plan

ALLEGHENY

4 of 9	12/3/87 Rev.	Foundation Plan
5 of 9	12/3/87 Rev.	Floor Framing Plan
6 of 9	12/4/87 Rev.	Wall Anchor Location
7 of 9	12/4/87 Rev.	Second Floor
8 of 9	6/22/87 Rev.	Roof Framing
9 of 9	6/4/87 Rev.	Building Section

Typical Drawings

Cover Sheet	8/27/85 Rev.	Standard Detail/Notes Symbols
D - 1	1/18/85	Typical Foundation Sections
D - 2	1/18/85	Attachment Details
D - 3	1/19/85	Wall Anchor Details
D - 4	8/27/85 Rev.	Window and Door Jambs Details
D - 5	8/27/85 Rev.	Construction Details
D - 6	8/27/85 Rev.	Dormer Details
D - 7 & 11	8/27/85 Rev.	Dormer Details
D - 8	8/27/85 Rev.	Porch Details
D - 9	8/27/85 Rev.	Gable Framing, Stairs and Collar Beam Details
D - 10	1/21/85	Fireplace
D - 12	8/27/85	Wall Section
	1988	Construction Manual

The Builder shall submit construction drawings to the local HUD Field Office with each application under HUD housing programs, which shall include the same or similar structural features as shown on the drawings listed above. Copies of these listed drawings shall also be furnished to the HUD Field Office by the Builder upon request. Drawings submitted to the HUD Field Office shall bear the seal and the signature of a registered architect or professional engineer.

MANUFACTURING PLANTS:

Log building components covered under this Bulletin will be produced in the following plants:

Appalachian Log Structures, Inc.
205 Oak Street
Princeton, WV 24740

Appalachian Log Structures, Inc.
Gardner Road
Princeton, WV 24740

The Charleston HUD Office will inspect the above plants in accordance with prescribed procedures.

The HUD Field Office in whose jurisdiction the manufacturing plant is located shall review and approve plant fabrication procedures and quality control program, to ensure compliance with approved plans and specifications. The quality control program includes field erection with crews either employed, trained, or supervised by the manufacturer or its representative. The field assembly and construction of the log housing system shall be in accordance with the latest edition of the manufacturer's "Assembly or Construction Manual."

The manufacturer or its representative shall certify and approve:

1. Proper erection of log walls and components;

2. Other structural components in floor and roof systems for compliance with specifications and HUD Minimum Property Standards; and

3. Connection of conventional building materials to log components.

RECORD OF PROPERTIES:

The manufacturer shall provide a list of the first ten properties in which the component or system described in this Bulletin is used. The list shall include the complete address or description of location, and approximate date of installation or erection. Failure of the manufacturer to provide HUD with the above information may result in cancellation of this Bulletin.

NOTICE OF CHANGES:

The manufacturer shall inform HUD in advance of changes in production facilities, transportation, field erection procedures, design, or materials used in this product. Further, HUD must be informed of any revision to corporate structure, change of address or change in name or affiliation of the prime manufacturer. Failure of the manufacturer to notify HUD of any of the above changes may result in cancellation of this Bulletin.

EVALUATION:

This SEB shall be valid for a period of three years from the date of initial issuance or most recent renewal or revision, whichever is later. The holder of this SEB shall apply for a renewal or revision 90 days prior to the Review Date printed on this SEB. Submittals for renewal or revision shall be sent to HUD Headquarters. Appropriate User Fee shall be sent to:

U.S. Department of Housing and Urban Development
Technical Suitability of Products Fees
P.O. Box 954199
St. Louis, MO 63195-4199

The holder of this SEB may apply for revision at any time prior to the Review Date. Minor revisions may be in the form of a supplement.

If the Department determines that a proposed renewal or supplement constitutes a revision, the appropriate User Fee for a revision will need to be submitted in accordance with Code of Federal Regulations 24 CFR 200.934, "User Fee System for the Technical Suitability of Products Program," and current User Fee Schedule.

CANCELLATION:

Failure to apply for a renewal or revision shall constitute a basis for cancellation of the SEB. HUD will notify the manufacturer that the SEB may be canceled when:

1. conditions under which the document was issued have changed so as to affect production of, or to compromise the integrity of the accepted material, product, or system,

2. the manufacturer has changed its organizational form without notifying HUD, or

3. the manufacturer has not complied with responsibilities it assumed as a condition of HUD's acceptance.

However, before cancellation, HUD will give the manufacturer a written notice, of the specific reasons for cancellation, and the opportunity to present views on why the SEB should not be canceled. No refund of fees will be made on a canceled document.

****

This Structural Engineering Bulletin is issued solely for the captioned firm and is not transferable to any person or successor entity.

****